PROPOSED AMENDMENT: FOR INTERVIEW PURPOSES ONLY

REMARKS

The Examiner has rejected claims 1-2, 9, 20-23 and 26 under 35 U.S.C. § 102(b) as being anticipated by Tanaka et al. U.S. Patent No. 5,361,968. Claims 5-8 and 25 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Tanaka et al. Claims 3-4, 10-12, 24 and 27 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Tanaka et al. in view of Murphy et al. ("The Rapid Manufacture of Metallic Components by Laser Surface Cladding").

Attached hereto is a marked-up version of the changes made to the claims by the current amendment. The attached page is captioned "Version with Markings to Show Changes Made." Also attached hereto is a clean copy of all claims now pending in this application.

Applicant would like to thank the Examiner, _________, for the interview which occurred on _________, 2001 between applicants' representative, Kristi L. Davidson, and the Examiner.

The specification has been amended to correct a typographical error on page 1, line 13. Patent No. 4,608,895, which was the patent intended to be incorporated, is referenced on page 12, line 10, and so it is believed that no new matter is added by this amendment.

Claim 23 has been canceled, new claims 28-29 have been added, and independent claims 1, 20, 21 and 22 have been amended to include that the blade material is deposited onto the die surface with a laser to build a blade of near net shape. Pending claims 2-12 and 22-29 each depend directly or indirectly from one of the amended independent claims 1, 20, 21 and 22, and so also include that the blade material is deposited onto the die surface with a laser to build a blade of near net shape. Tanaka et al. do not teach or suggest use of a laser nor a near net shape

PROPOSED AMENDMENT: FOR INTERVIEW PURPOSES ONLY

deposit, and thus there can be no anticipation of the claims as amended. Thus, the rejection of claims 1-2, 9, 20-22 and 26 under § 102 over Tanaka et al. is believed to be overcome by the present amendment.

With respect to the rejection of claims under § 103 over Tanaka et al. in view of Murphy et al., the independent claims have also been amended to specify that the blade is built from a material having a composition different than that of the die body surface and a hardness greater than that of the die body surface. Applicant submits that the claims, as amended, are not obvious over the combination of Tanaka et al. and Murphy.

Tanaka et al., in the background of the invention (Col. 1), discuss the prior art that led up to their development regarding trimming blades for metallic press dies. Tanaka et al. first describe the need for the finished blade to be harder than the bulk of the die. The die is a plate-like workpiece in which the trimming blade is in the form of an edge portion of the plate. (Col. 1, lines 1-15) To accomplish the hard edge portion, the die would be formed of a single low hardness base material, and the edge portion to be used as the trimming blade would subsequently be quenched by heat treatment. (Col. 1, lines 17-23) This method was found unacceptable due to either the occurrence of quench cracks or the inability to raise the hardness of the base material to a hardness sufficient for use as a trimming blade. (Col. 1, lines 23-29)

Tanaka et al. then described, again in the background of the invention (Col. 1, lines 30-36), the solution of removing the edge portion of the press die to form a chamfered surface and welding a hard material onto the base material. This welded material, however, then required significant machining to shape and define the corner trimming blade. Due to the

PROPOSED AMENDMENT: FOR INTERVIEW PURPOSES ONLY

hardness of the welded material, and its bulk beyond a near net shape, machining was difficult and limited to grinding techniques. Milling was not possible. (Col. 1, lines 41-52) This process, nonetheless, has been in use for over a hundred years.

Tanaka et al. thus addressed the problem of needing to form hard trimming edges on metallic press dies wherein the blade portion was amenable to substantial machining, yet could be made hard enough to function as a trimming blade.

Tanaka et al. proposed a process similar to the conventional hard material welding process, but instead welded a soft material onto the soft base material that could, after machining, be cryogenically treated to raise the hardness high enough to be suitable for trimming blade use. Machining was then possible by a broader range of techniques due to the softness of the material after welding. In the as-deposited or as-welded state, the blade material contains austenite and has a martensitic transformation starting temperature (Ms) below 150°C. The cryogenic treatment effectively converts austenite in the welded material to the harder martensite phase. Various compositional elements are described, and it is suggested that very strict control of the composition must be maintained to ensure that the Ms temperature remains low. Thus, martensite transformation is the effective means in Tanaka et al. for obtaining the requisite hardness for use in trimming applications.

The problem that the present applicants recognized with the method proposed by Tanaka et al., as well as prior welding techniques, is that the welding process, such as TIG/MIG welding, produces a large "puddle" of melted metal as a result of the inability to focus and control the heat applied from the welding tool. A large amount of heat is put into the surface of

PROPOSED AMENDMENT: FOR INTERVIEW PURPOSES ONLY

the workpiece surrounding the weld, which causes high surface distortion, annealing of the surrounding area, and cracking of the die body and blade. The welding process also induces a large amount of residual stress in the die body and blade, which can cause cracking and corrosion. The welding process also creates large, wide beads or "globs" of welding material, requiring significant machining to shape and define the blade. Thus, the Tanaka et al. process includes a relatively messy welding process in which damage occurs to the die due to the high, uncontrolled, unfocused heat used by the welding tool, followed by a significant machining step to remove large amounts of excess cladding material, and finally a hardening treatment for making the blade suitable for use, the success of which is highly dependent on the composition of the cladding material. By virtue of using a welding process, Tanaka et al. were motivated to find a solution that would allow them to carry out the significant machining necessary for defining a functional, precise, sharp cutting edge. Their solution was to deposit soft material having an appropriate composition to enable austenite-martensite transformation by cryogenic treatment following rough and finish machining.

The present invention, as set forth in the amended claims, to the contrary uses a laser cladding technique that does not rely on martensitic transformation as the hardening mechanism for the blades. The die surface is heated and hard, wear resistant blade material is laser cladded into the heated area. Lasers have the advantage of a well-defined and localized beam by which the amount of heat/energy applied to the surface of the die can be controlled. Surface distortion, annealing and cracking can be minimized due to the localized nature of the applied heat. Little to no residual stress is induced in the die body and blade. The bond with the

PROPOSED AMENDMENT: FOR INTERVIEW PURPOSES ONLY

die surface is also more uniform than with welding due to the high controllability of the laser cladding process.

The laser cladding technique is capable of producing small beads of material that can be accurately controlled for consistent quality and a near net shape deposit that requires far less subsequent machining to obtain the blade shape than welding processes. Thus, the fact that the material is of high hardness in the as-deposited state is of little significance with respect to machining as compared to the prior art described in Tanaka et al. due to the low excess of material that must be removed to shape the blade. Tanaka et al. must perform rough machining (substantial material removal) and finish machining (small material removal) to define the cutting edge. The shaping step in the present invention is finish machining by virtue of the near net shape deposit achieved by laser cladding. Only a small amount of material need be removed. Thus, the present invention solved the problem in a manner completely different than Tanaka et al. Rather than enabling significant material removal by machining, the present applicants eliminated the need for significant material removal. Tanaka et al. provides no teaching or suggestion for using a depositing technique other than welding.

The Murphy article relates to the art of rapid prototyping, which is fairly new technology. Rapid prototyping aids in the process of guiding a product from concept to market by automating the fabrication of a prototype part from a three-dimensional CAD drawing. The prototype part or physical model conveys more complete information about the product earlier in the development cycle. Because it is only used for purposes of visualizing what the final product will look like, there is no requirement that the part be functional. Rapid prototyping is only

PROPOSED AMENDMENT: FOR INTERVIEW PURPOSES ONLY

concerned with the shape and look of the part. Using a 3-D CAD drawing, the desired part is spliced into horizontal cross-sections, and the part is built up section by section until a complete model is formed.

Murphy et al. disclosed their experimental work of forming a metallic prototype part by laser cladding. They deposited either cobalt or 314 stainless steel onto a substrate of like material. Thus, they were laser cladding a soft material onto the same soft material to form a shape. Nowhere in the Murphy article did they teach or suggest that the laser clad shape could be used as a blade, and in fact, because it is rapid prototyping technology, the part is not intended to be functional. There is no teaching or suggestion in Murphy et al. that the laser cladding used for rapid prototyping could be substituted for welding technology used to produce cutting blades on the surface of a die body. Thus, there is no suggestion or motivation in either reference for combining any component with the other. "Combining prior art references without evidence of such a suggestion, teaching, or motivation simply takes the inventor's disclosure as a blueprint for piecing together the prior art to defeat patentability—the essence of hindsight." *In re Dembiczak*, 50 U.S.P.Q.2d 1614, 1617 (Fed. Cir. 1999) (citing *Interconnect Planning Corp. v. Feil*, 227 U.S.P.Q. 543, 547 (Fed. Cir. 1985).

Moreover, both Tanaka et al. and Murphy et al. disclose depositing soft material on like or similar soft material. Neither reference teaches depositing in a near net blade shape a material that is compositionally different and of greater hardness than the base material. Applicants discovered that laser cladding can be used to deposit hard, wear resistant materials in a near net shape to form a fully functional blade on a cutting die of softer, less expensive material

PROPOSED AMENDMENT: FOR INTERVIEW PURPOSES ONLY

thereby eliminating the extensive machining required with welding techniques, limiting or eliminating the need for subsequent hardening of the blade, and avoiding cracking and the like while gaining the ~~befit~~ benefit of less expensive base material. Tanaka et al. did not teach, suggest or recognize that a hard, wear resistant blade could be formed by near net shape deposition. Murphy et al. did not teach or suggest that laser cladding could be used to form functional parts of greater hardness than the underlying material. To take the teaching of laser deposition of soft materials to form non-functional prototype parts from Murphy et al. and substitute it for forming functional, hard cutting blades by welding techniques as desired by Tanaka et al. to arrive at the claimed invention is an exercise in hindsight that uses that which only the inventor taught against its teacher. Such hindsight-based obviousness is forbidden by current case law. *See e.g., id*; *Loctite Corp. v. Ultraseal Ltd.*, 228 U.S.P.Q. 90, 98 (Fed. Cir. 1985), *overruled on other grounds*; *W.L. Gore & Assoc. Inc. v. Garlock, Inc.*, 220 U.S.P.Q. 303, 313 (Fed. Cir. 1983). It is Applicants' position that the Examiner has failed to establish a *prima facie* case of obviousness, as there is no teaching, suggestion or motivation to combine the references in the manner in which the Examiner has done. Therefore it is submitted that claims 1-12, 20-22 and 24-27, as amended, and new claims 28-29 are allowable over the prior art of record, taken alone or an any proper combination.

In support of applicants position that the combination of references would not have been made to arrive at the present invention, and that the invention was not obvious, applicant submits a declaration from one skilled in the art of both laser and welding technologies.

PROPOSED AMENDMENT: FOR INTERVIEW PURPOSES ONLY

[Non-obviousness of dependent claims will be further addressed in formal response]

To also further support Applicants position of non-obviousness, submitted herewith are declarations from customers of Bernal Technologies, specifically Glad Products and Shorewood Packaging, who have purchased and are using cutting dies made in accordance with the teachings of the present application, as claimed. Because of the process used, applicants were able to focus on selection of the materials based upon their ultimate function. Because the blade can be deposited with the requisite hardness and having a composition different than the base material as appropriate for its function without regard to machining difficulties, long die life can be achieved. Distortion, cracking and tolerance problems are solved by the present invention, resulting in a cutting die that exhibits consistency, accuracy and longevity in use as a direct result of the claimed process. As attested to in the enclosed declarations, the cutting dies made in accordance with the claimed invention have met a long felt need in the industry for increased blade life and have met with significant commercial success.

In view of the foregoing amendments to the claims and remarks given herein, applicants respectfully believe this case is in condition for allowance and respectfully request allowance of the pending claims. If the Examiner believes any detailed language of the claims requires further discussion, the Examiner is respectfully asked to telephone the undersigned attorney so that the matter may be promptly resolved. The Examiner's prompt attention to this matter is appreciated.

PROPOSED AMENDMENT: FOR INTERVIEW PURPOSES ONLY

credits are necessary to complete this communication, please apply them to deposit account no. 23-3000.

Respectfully submitted,

WOOD, HERRON & EVANS, L.L.P.

By:____________________________
Kristi L. Davidson
Reg. No. 44,643

2700 Carew Tower
441 Vine Street
Cincinnati, OH 45202
(513) 241-2324 (voice)
(513) 421-7269 (facsimile)

K:\BERL\18A\response to 2nd OA.wpd

PROPOSED AMENDMENT: FOR INTERVIEW PURPOSES ONLY

<u>VERSION WITH MARKINGS TO SHOW CHANGES MADE</u>

Replace paragraph at page 1, line 4:

--Cutting dies are known for cutting or severing one portion of a stock material from another. For example, cutting dies are used for cutting sheets of paperboard or plastic or metal into predetermined blanks. In one form of known cutting operation, two rotary cylinders, each having small integral cutting blades extending radially from the cylindrical surface, are juxtaposed so that when rotated, the blades engage generally opposite sides of a work stock and cooperate to sever the stock into a blank, the shape of which is determined by the blade configuration. One such operation is illustrated in U.S. Patent No. [4,608,905] <u>4,608,895,</u> incorporated herein by reference.--

Amend claims:

1. (Amended) A method of forming a cutting die <u>including a die body and an integral blade extending outwardly from a surface of said die body, the method</u> comprising the steps of:

cladding a blade material onto [a] <u>an area of said</u> die <u>body</u> surface <u>by heating said area with a laser, introducing said blade material into the heated area, and building</u> [to form] a <u>near net shape</u> blade [extending] <u>of said blade material</u> outwardly from said surface<u>, wherein said blade material is compositionally different and of greater hardness than a base material forming said die body surface</u>; and

no support from the spec

MP12

shaping the cladded blade.

PROPOSED AMENDMENT: FOR INTERVIEW PURPOSES ONLY

2. (Amended) A method as in claim 1 wherein said cladding step includes:

heating [an] <u>said</u> area of said die <u>body</u> surface; and

introducing <u>said</u> blade material into the heated area and building [a] <u>said</u> blade of said <u>blade</u> material outwardly from said surface <u>in a single pass of said laser</u>.

3. (Amended) A method as in claim [2] <u>1 wherein the die body surface is cylindrical and</u> including heating said area with [a] <u>said</u> laser <u>and introducing said blade material into the heated area to completely build said blade on said cylindrical die body surface</u>.

4. (Amended) A method as in claim [2] <u>1</u> including introducing cladding powder <u>comprising a carbide</u> into the heated area for building said blade.

5. (Amended) A method as in claim [2] <u>1</u> wherein said shaping step includes shaping said blade by electrical discharge machining.

6. (Amended) A method as in claim [2] <u>1</u> wherein said shaping step includes shaping said blade by milling.

7. (Amended) A method as in claim [2] <u>1</u> wherein said shaping step includes shaping said blade by grinding.

PROPOSED AMENDMENT: FOR INTERVIEW PURPOSES ONLY

8 . A method as in claim 1 including the further step of heat treating said blade.

9. A method as in claim 1 including the further step of cryogenic treating said blade.

10 . (Amended) A method as in claim 1 wherein said cladding step includes:

scanning a laser beam along [a] said die body surface comprising a low grade material of less than about 60 Rockwell C hardness, in a path corresponding to a desired blade pattern;

new matter

melting said die surface along said path; and

said step including introducing

introducing [metal] a carbide-containing high grade material of at least about 60 Rockwell C hardness into said path while heating said path to build up a die blade in said pattern.

11 . A method as in claim 10 including heat treating said die blade after said shaping to harden said die blade.

12 . (Amended) A method as in claim [10] 1 wherein said [metal] introducing step includes introducing cladding powder [into said path] selected from the group consisting of D2 steel, CMP10V steel, CMP15V steel and a nickel based superalloy with 30-40% volume fraction tungsten carbide.

PROPOSED AMENDMENT: FOR INTERVIEW PURPOSES ONLY

20. (Amended) A method of forming a cutting die including a die body and an integral blade extending outwardly from a surface of said dic body, the method comprising the steps of:

cladding a blade material onto [a] an area of said die body surface by heating said area with a laser, and by depositing said blade material into the heated area in multiple successive layers to form a blade of near net shape extending outwardly from said surface, wherein said blade material is compositionally different and of greater hardness than a base material forming said die body surface and wherein said blade has a hardness equivalent to the final desired hardness of said blade; and

after said cladding step, shaping the cladded blade.

21. (Amended) A method of forming a cutting die comprising the steps of:

depositing a carbide-containing blade material in multiple successive layers onto a cylindrical die surface by laser cladding to form a near net shape cladded blade extending outwardly from said surface, wherein said blade material is compositionally diffcrent and of greater hardness than a base material forming said die surface; and

after said depositing step, shaping the cladded blade.

22. (Amended) A method of forming a cutting die comprising the steps of:

heating an area of a cylindrical die surface in a path corresponding to a desired blade pattern including intersecting blades;

PROPOSED AMENDMENT: FOR INTERVIEW PURPOSES ONLY

depositing a layer of blade material [onto a die surface] into said path by laser cladding, wherein said blade material is compositionally different and of greater hardness than a base material forming said die surface;

repeating the step of depositing blade material onto a preceding layer of blade material until a blade of desired thickness and near net shape is formed extending outwardly from said surface in said pattern; and

after said blade of desired thickness is formed, shaping the blade.

Claim 23 is canceled.

24. (Amended) A method as in claim [23] 22 including heating said area with [a] said laser and introducing a carbide-containing blade material into the heated area and building a blade having a hardness equivalent to the final desired hardness of said blade.

25. A method as in claim 22 including a further step of heat treating said blade after said shaping.

26. A method as in claim 22 including a further step of cryogenic treating said blade after said shaping.

27. (Amended) A method as in claim 22 wherein said depositing steps include:

PROPOSED AMENDMENT: FOR INTERVIEW PURPOSES ONLY

scanning a laser beam along [a] said die surface comprising a low grade material of less than 60 Rockwell C hardness, in [a] the path corresponding to [a] the desired blade pattern;

melting said die surface along said path; and

introducing [metal] a carbide containing high grade material of at least 60 Rockwell C hardness into said path while heating said path and repeating the scanning along said path to build up a die blade in said pattern.

28. (New) The method as in claim 1 wherein heating of said area is prior to said introducing said blade material.

29. (New) The method as in claim 1 wherein building said blade is in a pattern including intersecting portions.